

**Notice of Allowability**

Application No.

08/860,763

Examiner

Rudy Zervigon

Applicant(s)

TOKMULIN ET AL.

Art Unit

1763

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--**

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to the interviews conducted on 9/24 and 9/30/2004.
2. ☒ The allowed claim(s) is/are 2,3 and 5-16.
3. ☐ The drawings filed on \_\_\_\_\_ are accepted by the Examiner.
4. ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some\* c) ☐ None of the:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☒ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

5. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
6. ☒ CORRECTED DRAWINGS ( as "replacement sheets") must be submitted.
- (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review ( PTO-948) attached
- 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
- (b) ☒ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date 9/30/2004.
- Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
7. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

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|---|---|
| 1. <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 5. <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)                                   |
| 2. <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                | 6. <input checked="" type="checkbox"/> Interview Summary (PTO-413),<br>Paper No./Mail Date <u>9/30/2004</u> . |
| 3. <input type="checkbox"/> Information Disclosure Statements (PTO-1449 or PTO/SB/08),<br>Paper No./Mail Date _____ | 7. <input checked="" type="checkbox"/> Examiner's Amendment/Comment   |
| 4. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit<br>of Biological Material          | 8. <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance                          |
|   | 9. <input type="checkbox"/> Other _____.  |

**DETAILED ACTION**

**EXAMINER'S AMENDMENT**

1. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Myron Greenspan on September 24<sup>th</sup> and 30<sup>th</sup>, 2004.

The application has been amended as follows:

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IN THE CLAIMS:

1. (canceled)

2. (currently amended) A device for treating wafers with a plasma jet, comprising a plasma jet generator; gas supplying means; a set of holders for wafers to be treated, said holders having a drive for effecting angular displacement thereof and for facing a generator plasma jet, each of the holders being made in the form of a horizontal platform mounted for rotation about an axis passing through a geometric center thereof and perpendicular to a plane of said platform, said plasma jet and wafer holders being displaced with respect to each other and may be in or out of contact with each other, said plasma jet generator being located such that a plasma jet is directed upwardly in respect of a plane of said horizontal platforms of said wafer holders to maintain the wafers in a suspended state proximate to but out of contact with associated platforms; and cooling means associated with each horizontal platform in fluid flow communication with said gas supplying means and located such that resulting gas flows permit the positioning of the platform near a holder and improve cooling of individual areas over the wafer surfaces while avoiding the need to provide additional cooling of said plasma generator due to natural convection of the hot gases, each wafer holder being provided with at least one vortex chamber and at least one tangential channel in fluid flow communication between said gas

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supplying means and said at least one vortex chamber.

3. (previously presented) A device as defined in claim 2, wherein said plasma jet generator is mounted on a base on a height adjustable support that allows the treatment temperature to be changed according to desired treatment or processing of said wafers.

4. (canceled)

5. (previously presented) A device as defined in claim 14, wherein said closed chamber is provided with a window in which a movable shutter is mounted, said manipulator being located to contact with said storage devices directly and with said wafer holder indirectly, through the chamber window.

6. (previously presented) A device as defined in claim 2, wherein said cooling means comprises a plurality of chambers each in proximity to and open in the direction of a wafer held in a position for treatment, said chambers being connected to said gas supplying means.

7. (currently amended) A device for treating wafers with a plasma jet, comprising a plasma jet generator; gas supplying means; a set of holders for wafers to be treated, said holders having a drive for effecting angular displacement thereof and for facing a generator plasma jet; each of the holders being made in the form of a horizontal platform mounted for rotation about an axis passing through a geometric center thereof and perpendicular to a plane of said platform; said plasma jet and wafer holders being displaced with respect to each other and may be in or out of

contact with each other; a plasma jet generator located such that a plasma jet is directed in the direction of said horizontal platforms of said wafer holders, each wafer holder being provided with at least [three] one vortex [chambers] chamber and [three] at least one tangential [channels] channel in fluid flow communication between said gas supplying means and said at least one vortex chamber [chambers], said chambers defining axes substantially perpendicular to a plane of said horizontal platforms; each of said vortex chambers being provided with an open portion located on a level end surface of the wafer holder, coupled through the tangential channel to said gas supplying means and located such that resulting vortex flows formed permit the positioning of each wafer near the holder and cooling of its individual areas to equalize, over each wafer surface, an amount of energy used for treating the wafer surfaces.

8. (previously presented) A device as defined in claim 7, further comprising a manipulator; storage devices for the wafers to be treated; and a closed chamber having a gas exchange system with the wafer holders and a plasma jet generator located inside said chamber.

9. (previously presented) A device as defined in claim 8, wherein said closed chamber is provided with a window in which a movable shutter is mounted, said manipulator being located to contact with said storage devices directly and with said wafer holder indirectly, through the chamber window.

10. (currently amended) A device for treating wafers with a plasma jet,

comprising a plasma jet generator; gas supplying means; a set of holders for wafers to be treated, each having an edge, said holders having a drive for effecting angular displacement thereof and for facing a generator plasma jet, each of the holders being made in the form of a horizontal platform mounted for rotation about an axis passing through a geometric center thereof and being perpendicular to a plane of said platform; said plasma jet and wafer holders being displaced with respect to each other and may be in or out of contact with each other, a plasma jet generator located such that a plasma jet is directed in the direction of said horizontal platforms of said wafer holders, each of the wafer holders being provided with a limiter at the edges and cooling means associated with each horizontal platform in fluid flow communication with said gas supplying means and located such that resulting gas flows permit the positioning of each wafer near a holder and cooling of its individual areas, said limiters on the wafer holder platforms having lengths and being arranged to limit maximum deviation from axisymmetric arrangement of the treated wafers during treatments thereof, each wafer holder being provided with at least one vortex chamber and at least one tangential channel in fluid flow communication between said gas supplying means and said at least one vortex chamber.

11. (previously presented) A device as defined in claim 10, further comprising a manipulator; storage devices for the wafers to be treated; and a closed chamber having a gas exchange system with the wafer holders and a plasma jet generator located inside said chamber.

12. (previously presented) A device as defined in claim 11, wherein said closed chamber is provided with a window in which a movable shutter is mounted, said manipulator being located to contact with said storage devices directly and with said wafer holder indirectly, through the chamber window.

13. (previously presented) A device as defined in claim 10, wherein said limiters on the wafer holder platforms are fabricated as rods mounted at an angle  $\alpha > 90^\circ$  to the plane of said horizontal platform of the wafer holder, and their length,  $l$ , is chosen such that

$$2l \sin (\alpha > 90^\circ) > \Delta,$$

where  $\Delta$  denotes a maximum deviation from axisymmetric arrangement of the treated wafers during treatments thereof.

14. (currently amended) A device for treating wafers with a plasma jet, comprising a plasma jet generator; gas supplying means; a set of holders for wafers to be treated, said holders having a drive for effecting angular displacement thereof and for facing a generator plasma jet; each of the holders being made in the form of a horizontal platform mounted for rotation about an axis passing through a geometric center thereof and perpendicular to a plane of said platform; said plasma jet and wafer holders being displaced with respect to each other and may be in or out of contact with each other, said plasma jet generator being located such that a plasma jet is directed upwardly in respect of a plane of said horizontal platforms of said wafer holders; cooling means associated with each horizontal platform in fluid flow

communication with said gas supplying means and located such that resulting gas flows permit the positioning of the platform near a holder and improve cooling of individual areas over the wafer surfaces while avoiding the need to provide additional cooling of said plasma generator due to natural convection of the hot gases; storage devices for the wafers to be treated; a manipulator for manipulating individual wafers in relation to said platforms; and a closed chamber having a gas exchange system with the wafer holders and a plasma jet generator located inside said chamber, each wafer holder being provided with at least one vortex chamber and at least one tangential channel in fluid flow communication between said gas supplying means and said at least one vortex chamber.

15. (Previously presented) A device as defined in claim 7, wherein said plasma jet generator is mounted on a base on a height adjustable support that allows the treatment temperature to be changed according to desired treatment or processing of said wafers.

16. (Previously presented) A device as defined in claim 7, wherein said cooling means comprises a plurality of chambers each in proximity to and open in the direction of a wafer held in a position for treatment, said chambers being connected to said gas supplying means.

### *Drawings*

2. The following changes to the drawings have been approved by the examiner and agreed upon by applicant: Rename all Figure numbers to "Fig." Or "Figure". In order to avoid abandonment of the application, applicant must make these above agreed upon drawing changes.



***Allowable Subject Matter***

3. Claims 2, 3, and 5-16 are allowed.

4. The following is an examiner's statement of reasons for allowance: The closest available prior art references are to Ahonen (USPat. 5,308,461), Masashi Inoue (JP05-033534 Applicant's IDS reference), and Sarma et al (USPat. 4,343,830). Refer to the Examiner's last office action mailed September 9<sup>th</sup>, 2003. Applicant's response filed July 12<sup>th</sup>, 2004 was carefully considered and the Examiner agrees with Applicant's positions as stated in the last paragraph of page 13. Specifically, Applicant states that none of the prior art references teach wafer holders "with at least three vortex chambers and three tangential channels...". The closest available prior art relevant to this claim limitation are the figures and abstract of Masashi Inoue (JP05-033534 Applicant's IDS reference) who teaches a generic Bernoulli wafer chuck, although absent "at least one vortex chamber and at least one tangential channel...". As a result the Examiner contacted Mr. Greenspan to request that similar claim language be incorporated into all pending independent claims. Mr. Greenspan agreed to the above claim amendments.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

***Conclusion***

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Rudy Zervigon whose telephone number is (571) 272.1442. The examiner can normally be reached on a Monday through Thursday schedule from

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8am through 7pm. The official fax phone number for the 1763 art unit is (703) 872-9306. Any Inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Chemical and Materials Engineering art unit receptionist at (571) 272-1700. If the examiner can not be reached please contact the examiner's supervisor, Gregory L. Mills, at (571) 272-1439.

*Gregory L. Mills*  
9/30/14